

Preface and acknowledgements

Problematizing the turn to plasticity

Since the turn of the twenty-first century, human biology has become seemingly more sensitive and perhaps vulnerable to exposure to biophysical environments and sociocultural experiences. Scientific claims about the openness of the brain, the body, genome expression and even biological heredity to history, biography and culture have become increasingly visible over the last two decades. Paralleling a similar process in the neurosciences, the powerful rise of epigenetics and the consolidation of developmental origins of health and disease (DOHaD) since 2000 signals a shift away from notions of biological fixedness and toward ideas of "impressionability" of biological material – ideas that seemed forgotten during most of the twentieth century at the peak of genetic explanations. Rather than being hardwired, gene expression, brain structures and biological bodies are rewritten as alterable and capable of modifying themselves in response to pressures from inside and outside the body itself. In a word, they are described as *plastic*. Arguments about "biosocial research" and "biosocial entanglement" also reflect this awareness of a multi-causal and multi-level co-determination of social and biological matter, of what lies beyond and within the skin. Alongside these epistemic shifts, a whole new landscape of ethical and sociological quandaries is rapidly unfolding. In this landscape, some of the conventional dichotomies forged during the last century are rapidly becoming obsolete: that biological heredity is not environment and environment is not heredity; that cultural factors are above the skin and not in the gut, the bones, or the genes; that genes are

either the bases of behaviours or are irrelevant to them; that if race is a social construction, it is not a biological reality; that biological explanations are individualistic and erase social factors, while sociocultural explanations omit biological embedding; that heredity stops at birth and is only contributed to by biological parents; that plasticity is counter to biological determinism and racialism, and taking the side of nurture is more progressive than endorsing the stability of traits in developmental debates.

Rather than examining these claims about plasticity directly in a prescriptive fashion, this book takes a longer genealogical perspective to suggest a more complicated state of affairs about the self-proclaimed revolutionary nature of these ideas. This *longue durée* history focuses on the widespread ancient and early modern belief in the plasticity of biological matter, its permeability to surroundings, the link between environment, food and health, and the biopolitical techniques required to govern a porous body. Rather than simply the latest episode in a history of innovation, it sees the present challenge to biological fixedness as encompassing the notions of multiple historical times and perturbingly resonating with older and non-Western epistemologies of the body.

The book problematizes the ubiquitous claim that epigenetics and related ideas of plasticity are “a break from past thinking” about heredity (Bonduriansky and Day, 2018). It reminds the reader that past thinking about heredity (i.e. genetics) was in itself a huge (revolutionary) break with traditional views of heredity and generation.¹ These older views displayed some of the characteristics (including a belief in parental and ancestral influences on heredity, especially maternal) that are resurfacing today in the molecular language of twenty-first-century biology (see Zimmer, 2018: 542–545). If plasticity means an ongoing interaction with the surrounding environment, and biological matter is always nurtured and situated, corporeal plasticity seems the standard, not the revolutionary, view in a global history of body-world configurations; at least, that is, before the rise of the modern biomedical body in Europe after the second half of the nineteenth century. Rather than an explanation of plasticity, the underlying question emerging from this book is the opposite: how did biological fixity (to a certain degree) and abstract universality of the body come into being? How did nineteenth-century European biology come to suggest an idea of relative insulation of the body, heredity and internal milieu as a condition for independence, freedom and individuality (Bernard, 1878; Weismann, 1891)? How did such views later come to dominate the twentieth century and steer competing paradigms?

By “conjugating” (Anderson, 2009) knowledge and ethical visions of the body generated by the latest advancements in molecular biology with a range

of discourses about biological matter preceding this nineteenth-century modernistic break, this book raises questions about the temporality, novelty, direction and pace of change in historical knowledge. It points to a deeper genealogical tree for the epigenetic body that is well beyond the controversial “return of Lamarckism”, given that I situate Lamarckism within a much older history of plasticity of organisms to their surroundings. When William James claims that pre-Darwinians “thought only of adaptation” and “made organisms plastic to environment” (1988), I take this notion seriously and look at it as an intellectual thread to cover periods well before modern evolutionary debates.

To offer an intellectual map beyond twentieth-century biology–society debates, *Impressionable Biologies* follows three axes of analysis: science, knowledge and power.

- 1) The scientific axis addresses a growing obsolescence of modernistic views of the body, biology and heredity based on notions of a secure and unique individual core, a relative separateness from environmental factors, and the skin as a well-defined boundary between inner and outer, the biological and the social. At the scientific level, this obsolescence is mostly driven by the awareness of a growing number of anomalies in the long-held “normal” views of genetic functioning that were forged during the twentieth century. Hype and uncertainties are far from rare in contemporary challenges to genetic determinism, and many emerging findings in epigenetics or microbiomics still await validation in what is called the “postgenomic era”. However, a facile critique that points its finger at sensationalistic findings would obscure the impressive growth of research and integration between emerging programs, which genuinely challenges and even violates long-held views in biology. Often the emphasis of these novel findings is about bringing the environment into the genome. And yet, one of the most intriguing aspects of epigenetic research is not the addition of the environment to an already existing genome, but the entire reconfiguration of the ontology of the genome. The gene is no longer experimented on and represented as an informational medium, but as a very material and impressionable body that brings back to actuality ancient metaphors of plasticity as marking and imprinting. This embodied nature of the genome may be used to challenge the flatness of the digital language of molecular biology.
- 2) The knowledge axis extends my previous argument (2016) about a return of the repressed in contemporary epigenetic research, or that scientific time future may be – in some cases at least – “contained in time past”

- (Gissis, 2017). However, here, the "repressed" is not just nineteenth-century soft heredity but ancient, early modern and non-Western body-world configurations based on ideas and practices of bodily fluidity. Notions like the maternal imprint, the specific connection between body and place, the environment as a bioactive force, the blurring of the boundary between food and drug, the porosity of heredity to ancestral events, and even the inheritance of acquired behaviours, pangenesis and telegony (notions which have been recently evoked in molecular forms in epigenetics²) have always been well known in ancient, early modern and non-Western medical doctrines. It is this molecular resurfacing of past tropes implied by epigenetics that offers a unique opportunity to question polarities between "traditional" and "modern" knowledge. By focusing on how bodies are rewritten as plastic and vulnerable in epigenetics, the book may contribute not only to challenging the congratulatory rhetoric of innovation in contemporary life sciences but also to focusing on forms of epistemic hybridity where past and present, centre and periphery, global and situated exist in a deeply entangled way (Raj, 2013; Anderson, 2014). This means, genealogically, the possibility of a reappraisal of counter-traditions of the body as genuine sites of knowledge production. Where one sees the accumulation of pacified knowledge, genealogy reveals bellicose relationships.
- 3) The power axis highlights the complex coproduction of the political and the biological in the history of the body and the legacy of the politics of plasticity, at both the individual and the collective level. By focusing on the government of malleable bodies – always porous to environmental influences – the book sheds light on an alternative form of biopolitics and challenges views of an inherently liberating potential of biological plasticity. Building on the longer history, it dissects the contemporary implications of corporeal and genomic plasticity and (re-)emerging connections of environment and disease for notions of risk, responsibility and intervention. If the body is rewritten as permeable to its genomic core, it is also vulnerable to new risks and amenable to new forms of intervention, particularly in special windows of biological sensitivity. During these peaks of plasticity, prevention and other policy initiatives are described as more effective, but the lasting impacts of negative experiences are also deemed more significant and difficult to correct.

Finally, the book addresses the impact of epigenetics on existing notions of plasticity in the life sciences. Epigenetic research does not exhaust plasticity, a complex term that encompasses multiple research programs in biology,

often with competing meanings. However, epigenetics is rapidly becoming a key mechanism in several iterations of plasticity, especially in neuroscience and gene expression. Epigenetics, I argue, contributes in this way to shifting the overall inflection of the term across the biosciences. It brings to the fore a more complex meaning of plasticity that is less about potential for reorganization and optimization and more about absorption of environmental disruptions, inertia and viscosity of long-term effects. This is somehow a bleaker and certainly more sobering inflection of plasticity, which is far from being the opposite of stability or even fixity (Bateson and Gluckman, 2011). It is a plasticity of enfoldment in ancestral histories and entanglement in places that challenges both modernistic and postmodernistic appropriation of the term as, respectively, a property securely in the possession of the sovereign consumer or a symbol for infinite freedom and fluidity of identity.

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Notes

- 1 In politics, the term “counter-revolution” is often used to describe a break that removes and overturns the conditions of a previous revolutionary break; however, to think of the current challenges to the modernistic body of biomedicine (and its views of heredity, reproduction and relationships to the environment) in these terms would render too simplistic the argument here advanced about the coexistence of multiple temporalities in the history of science.
- 2 For molecular versions of inheritance of acquired behaviours, see Bohacek and Mansuy (2015). For pangenesis (direct communication between somatic and germ cells) in which exosomes potentially play the role of Darwin’s gemmules, see Zimmer’s comment (2018: 545) to Cossetti et al. (2014), and Sharma (2017). For molecular versions of telegony (how a previous mate’s features are passed to offspring), see Crean et al. (2014).